(12) UK Patent Application (19) GB (11) 2 166 678 A

(43) Application published 14 May 1986

(21) Application No 8527410

(22) Date of filing 7 Nov 1985

(30) Priority data

(31) 8428314 (32) 9 Nov 1984 (33) GB
8522521 11 Sep 1985

(51) INT CL[4]
B23B 3/18

(52) Domestic classification
B3T 4A12A 4A12B6 4A12B7 4A12B8 4A20A 4B10 4B12D 4B12P 4B27B

(71) Applicant
Robert Frederick Gardner,
"Ashfield", Welford Road, Creaton, Northampton

(72) Inventor
Robert Frederick Gardner

(74) Agent and/or Address for Service
Urquhart-Dykes & Lord, 419B Midsummer House,
Midsummer Boulevard, Central Milton Keynes MK9 3BN

(56) Documents cited

GB A 2106438	GB 1107285
GB 1579812	EP A 0027253
GB 1445552	US 3943802
GB 1444301	US 3813745

(58) Field of search
B3T
Selected US specifications from IPC sub-class B23B

(54) Multi turret lathe

(57) The lathe comprises two turrets 20, 22 adjacent the headstock, one to the rear and one to the front of the workpiece W. The two turrets may be displaceable independently of each other both lengthwise and across the lathe. Each turret may be turned around its vertical axis and hold two oppositely-directed tools 21, 21a, so that either tool is brought into use by a 180° turn and the other tool is directed away from the workpiece and cannot interfere. The two turrets may be carried in an extended support across the axis, the support being movable along the lathe. A rear turret 24 is movable along the lathe. The lathe has a gripper and a parting-off slide 30.

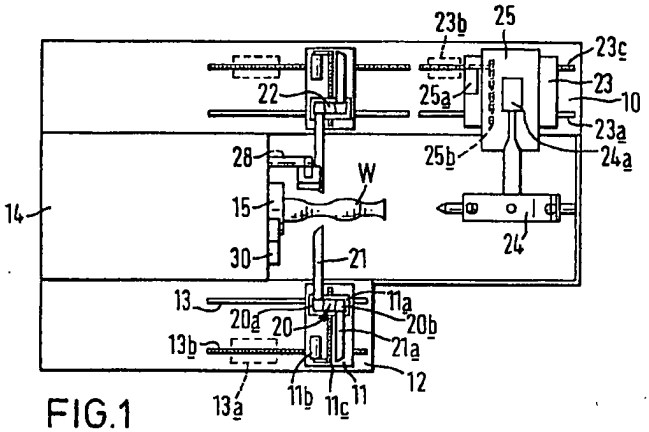


FIG.1

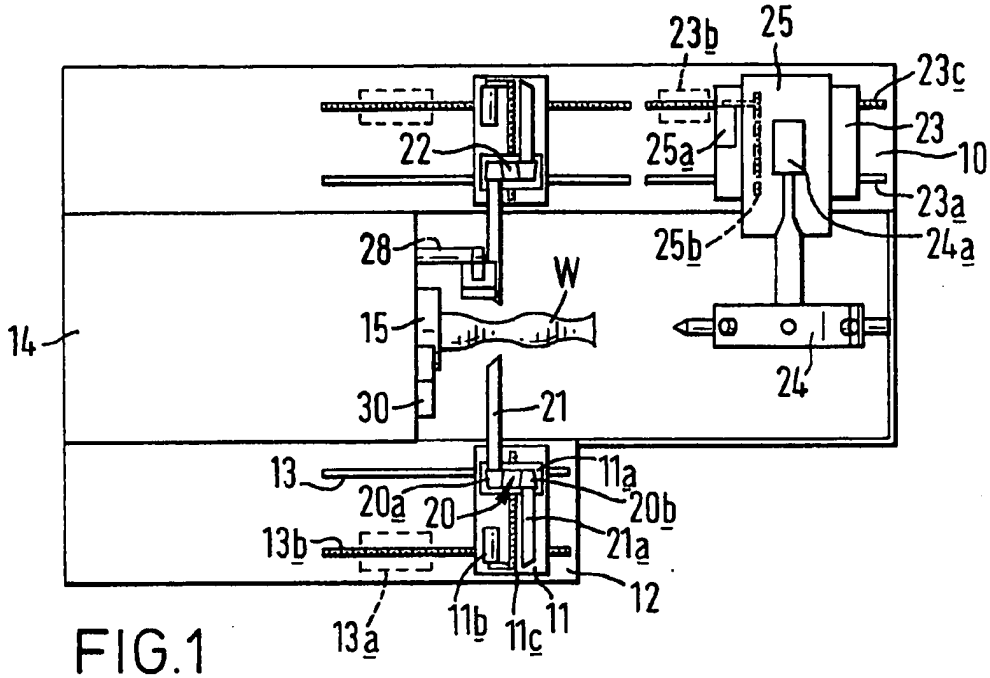
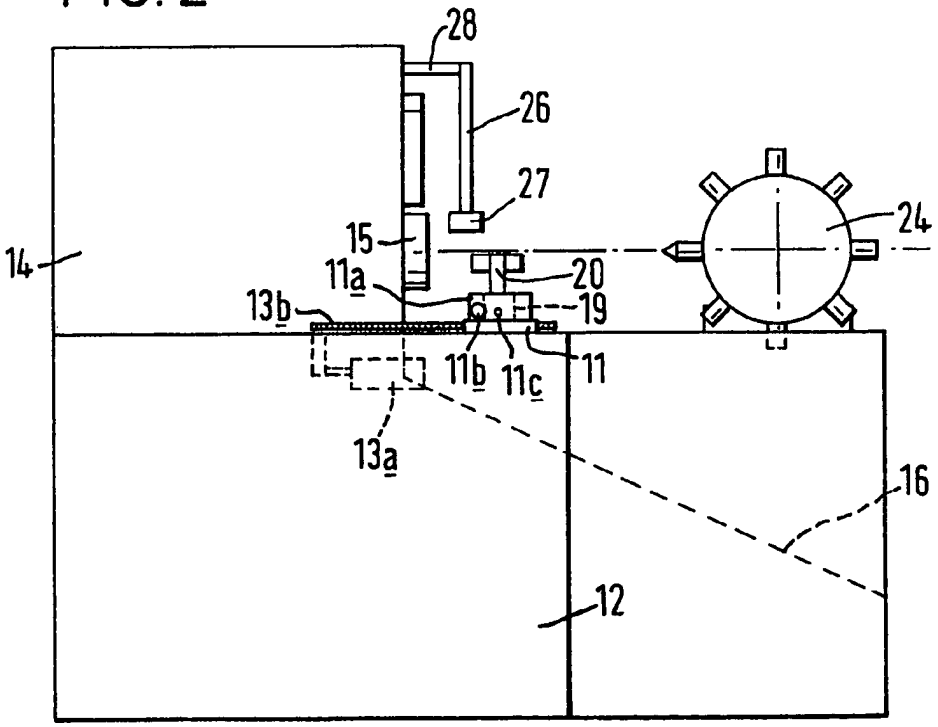

23b
25
23c
22
25a
23
10
23a
28
25b
24a
W
14
15
24
30
21
13
11a
20a
20
20b
13b
21a
12
13a
11b
11c
11

FIG.1

FIG. 2


28
26
27
24
14
15
11a
20
13b
19
11b
11c
11
13a
16
12

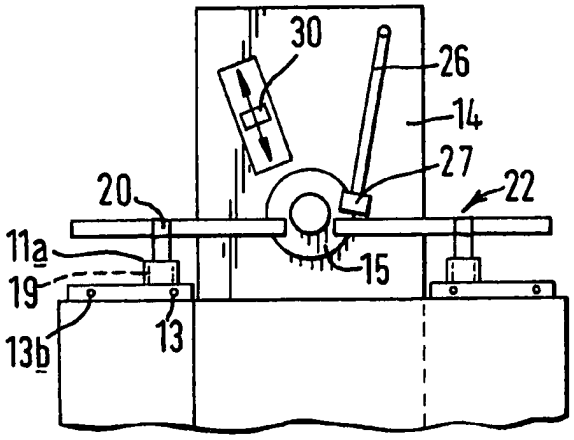


FIG.3.

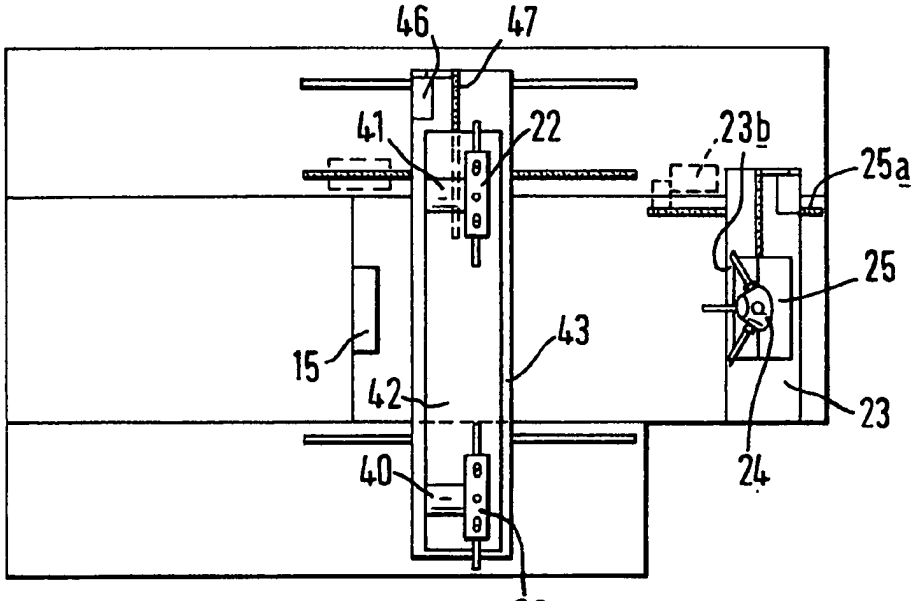


FIG.4.

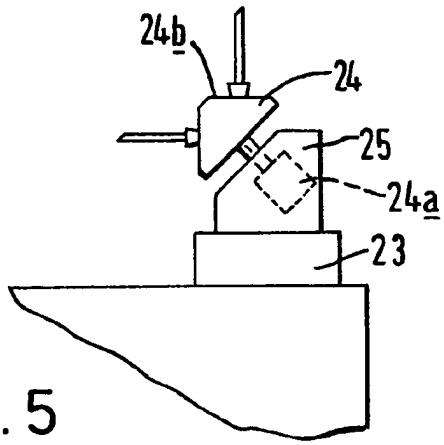


FIG. 5

SPECIFICATION

Lathe

This invention relates to a lathe of improved arrangement.

It is known to provide a lathe with tool holders adjacent its headstock end and also with a rotatable turret (mounting a plurality of tool holders) at the tailstock end, this turret being displaceable along the axis of the lathe.

In accordance with this invention, there is provided a lathe having two turrets at its headstock end, one to the rear and the other in front of the workpiece, these two turrets being independently displaceable both lengthwise and across the lathe and each being provided with tool holders.

The front and rear headstock turrets may be rotatable about vertical axes and each provided with two oppositely- directed tool holders so as to bring either tool into use by a 180° rotation of the respective turret. Alternatively, each of these turrets may comprise a drum turret and this may be rotatable, or indexing, about an axis extending lengthwise of the lathe.

Preferably, the lathe further has a turret at its tailstock end, this tailstock turret being displaceable lengthwise (and possibly also across) the lathe. This tailstock turret may be a drum turret and may be mounted for rotation or indexing about a horizontal axis extending across the lathe.

This arrangement of the lathe provides for considerable versatility, with the three turrets available for choice of the tools which they hold and with the three turrets independently displaceable. Where each of the headstock turrets has two oppositely-directed tool holders, then with one of its two tools in use, its second tool is projecting in the opposite direction and there is no risk of it interfering with the workpiece or with any other part of the lathe. The displacements of the three turrets are preferably limited by software control so that no tool of any one turret will interfere with any tool of the other turrets. The tailstock turret may be used not only for work along the lathe axis (i.e. onto the end of the workpiece) but also, when displaced away from the lathe axis, for work across the lathe (i.e. against the side of the workpiece): thus in particular the tailstock turret is arranged to hold tools directed along the lathe axis when in use and tools directed across the lathe axis.

Also in accordance with this invention, there is provided a lathe having a turret at its headstock end provided with two tool holders for holding two oppositely-directed tools, the turret being rotatable through 180° to bring one tool into use instead of the second. There may be two such turrets at the headstock end, one to the rear and the other in front of the workpiece and these two turrets being independently displaceable both lengthwise and across the lathe as described above, or instead these two turrets may be mounted on a common slide so as to be displaceable together both lengthwise and across the lathe. But in any event, with one of the two tools of a headstock turret in use, the other tool is directed away from the workpiece and will provide no rish of collision or interference with the workpiece or with the chuck or with the tools of any tail turret which may also be provided.

In an embodiment of the lathe to be described, the structure includes a rear block mounting a tailstock turret and a rear headstock turret and incorporating the guide and drive arrangements for displacing these turrets. The structure further includes a front block mounting the front headstock turret and incorporating its guide and drive arrangements. An intermediate block, at one end of the lathe, mounts the headstock itself and its drive arrangements.

This embodiment of the invention will now be described, by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic plan view of a lathe in accordance with this invention;

Figure 2 is a diagrammatic front elevation of the lathe;

Figure 3 is a diagrammatic view of the lathe from its right-hand end;

Figure 4 is a plan view of a modified lathe; and

Figure 5 is a front view of part of this modified lathe, to show its tail turret.

The structure of the lathe which is shown comprises a rear rectangular block or housing 10, and front rectangular block or housing 12 which is shorter than the rear block 10, and an intermediate block or housing 14 at the headstock end, interconnecting the front and rear blocks and being of greater height. The lathe further comprises a bed 16 between the front and rear blocks, this bed sloping downwards from the headstock end so that swarf removed from the workpiece W will fall to the right-hand end of the machine, where a collecting box may be arranged. The machine incorporates a computer numerical control system having its control panel indicated diagrammatically at 17.

The housing 14 mounts the headstock 15 of the lathe and incorporates the drive arrangements for the headstock. The front housing 12 mounts a front turret 20 and incorporates guide and drive arrangements for displacing and turning this turret 20. Thus, a slide 11 is engaged in a guide 13 and is displaced lengthwise of the lathe by a motor 13*a* driving a lead screw 13*b* which is engaged with the slide 11. The slide 11 mounts a further slide 11*a* which is displaceable transversely of the lathe by a motor 11*b* driving a lead screw 11*c* engaged with the further slide 11*a*. This slide 11*a* mounts the turret 20, which may be turned through 180° on its vertical axis by a motor 19. The turret 20 has two oppositely-directed tool holders 20*a*, 20*b* which removably receive tools 21, 21*a*. Thus, one or other of these tools will be in use. The rear housing mounts a similar turret 22 and incorporates similar guide and drive arrangements for displacing it both lengthwise and crosswise of the machine and for turning it through 180°. The rear housing mounts a tailstock turret 24, and incorporates guide and drive arrangements for displacing this turret lengthwise, and possibly also crosswise, of the lathe. Thus, a slide 23 is engaged in a guide

23*a* and is displaced lengthwise of the lathe by a motor 23*b* driving a lead screw 23*c* engaged with the slide 23. The slide 23 mounts a further slide 25 which is displaceable transversely of the lathe by a motor 25*a* driving a lead screw 25*b* engaged with the further slide 25. The slide 25 mounts the turret 24 and a motor 24*a* for indexing the turret 24 around on its axis. The movements of the three turrets are controlled by the computer numerical control system and limited by software control (each tool relative to the others) so that no tool of any one turret will interfere with any tool of the other turrets.

The headstock is arranged for the machine to carry out bar work (for which case an automatic bar feed device is incorporated) or chuck work. For the latter, an automatic leading arm is perferably provided: this arm normally hangs downwards from a shaft 28 on which it is mounted. The shaft serves to displace the arm lengthwise of the machine if required and the arm includes a gripper 27 at its outer end. The arm can thus be swung back rearwards to pick up a workpiece blank, then swung forwards to bring the blank onto the machine axis, then displaced linearly to engage the workpiece with the chuck.

The headstock housing 14 further mounts a slide 30 serving for parting-off when carrying out bar work.

The tailstock turret may include a chuck or stock for holding the tail end of a workpiece (its opposite end being held by the headstock): the two headstock turrets can then both be used at the same time, one (say the rear turret) working towards the tailstock end of the workpiece and the other (say the front turret) working towards the headstock end of the workpiece.

Preferably, each of the three turrets (i.e. the entire turret together with its tool holders end tools themselves) is arranged to be removable, so that it can be replaced by another assembly with different tools or combination of tools.

Figure 4 and 5 show a number of modifications, each of which is individually applicable to the embodiment of lathe which has just been described. Firstly, the two headstock turrets 20, 22 comprise drum turrets indexing about respective axes lengthwise of the lathe, for which motors 40, 41 are provided. Also, the turrets and their motors are mounted to a common slide 42 which is in turn mounted to a slide 43. The latter slide 43 is displaceable lengthwise of the lathe by motor 44 driving a lead screw 45 engaged with the slide, and slide 42 is displaceable across the slide 43 (and hence across the lathe) by a motor 46 driving a lead screw 47 engaged with slide 42. Furthermore, the tail turret 24 is mounted with its axis in a vertical plane, set at 45° to the horizontal. It has four and only four tool holders, for respective tools radiating at 90° intervals from a conical surface 24*b*. Thus, with one tool in use and directed along the lathe axis, the diametrically opposite tool projects upwards, with a requirement for less lathe length to be occupied by the tail turret. This tail turret is mounted on a slide 25 for displacement across the lathe, and slide 25 is mounted on a slide 23 for displacement lengthwise of the lathe, as in the embodiment Figure 1 to 3.

CLAIMS

1. A lathe, comprising a headstock for holding a workpiece, the headstock being an axis extending lengthwise of the lathe, a first turret positioned adjacent the headstock to the rear of the headstock axis and having an indexing axis, a second turret positioned adjacent the headstock to the front of the headstock axis and having an indexing axis, each turret including tool holders for removably receiving tools for working on a workpiece held by the headstock, means for displacing the first turret lenghtwise of the lathe, means for displacing the turret across the lathe, means for displacing the second turret lengthwise of the lathe independently of any lengthwise displacement of the first turret, means for displacing the second turret across the lathe independently of any displacement of the first turret across the lathe, means for indexing the first turret around its indexing axis and means for indexing the second turret around its indexing axis.

2. A lathe as claimed in claim 1, in which each of said first and second turrets comprises a drum turret with its indexing axis parallel to the headstock axis.

3. A lathe as claimed in claim 1, in which each of said first and second turrets has its indexing axis vertical, and each turret is provided with two oppositely-directed tool holders such that either of two tools is brought into use by a 180° rotation of the respective turret.

4. A lathe as claimed in claim 1, further comprising a tail turret which comprises a drum turret having an indexing axis transverse of the lathe, and means for displacing said drum turret lengthwise of the lathe.

5. A lathe as claimed in claim 4, further comprising means for displacing said tail turret transversely of said lathe.

6. A lathe as claimed in claim 1, further comprising a tail turret which comprises a drum turret having an indexing axis in a vertical plane, said tail turret having a conical surface and a plurality of tool holders radiating from this surface such that with one tool in use, a diametrically-opposite tool is directed upwardly.

7. A lathe a claimed in claim 1, further comprising means for automatically leading workpieces into the lathe headstock, comprising a pivoted arm having a workpiece gripper.

8. A lathe, comprising a headstock for holding a workpiece, the headstock having an axis extending lengthwise of the lathe, a first turret positioned adjacent the headstock and having a vertical indexing axis, the first turret comprising two tool holders for removably receiving tools for working on a workpiece held by the headstock, the tool holders being oppositely-directed and radiating from said indexing axis, and means for rotating said first turret through 180° around its indexing axis to bring one

or other of the two tools into use.

9. A lathe as claimed in claim 8, in which said first turret is positioned to the rear of said headstock axis and a second turret is provided, positiond adjacent said headstock to the front of said headstock axis, said second turret having a vertical idexing axis and comprising two tool holders for removably receiving tools for working on a workpiece held by the headstock, the two holders of said second turret being oppositely-directed and radiating from said indexing axis, the lathe further comprising means for rotating said second turret through 180° around its indexing axis to bring one or other of its two tools into use.

10. A lathe as claimed in claim 9, further comprising a first slide to which said first and second turrets are both mounted, a second slide to which said first slide is mounted, means for displacing the first slide relative to the second slide transversely of said lathe, and means for displacing the second slide lengthwise of the lathe.

11. A lathe as claimed in claim 8, further comprising a tail turret which comprises a drum turret having an indexing axis transverse of the lathe, and means for displacing said drum turret lengthwise of the lathe.

12. A lathe as claimed in claim 11, further comprising means for displacing said tail turret transversely of said lathe.

13. A lathe as claimed in claim 8, further comprising a tail turret which comprises a drum turret having an indexing axis in a vertical plane, said tail turret having a conical surface and a plurality of tool holders radiating from this surface such that with one tool in use, a diametrically-opposite tool is directed upwardly.

14. A lathe as claimed in claim 8, further comprising means for automatically loading workpieces into the lathe headstock, comprising a pivoted arm having a workpiece gripper.

Printed in the UK for HMSO, D8818935, 3/86, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.